US Army Corps
of Engineers

Code Forum

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CEMP-C

Subject: Requirements for Testing, Adjusting and Balancing of HVAC Systems

Applicability: Information

References: CEGS 15990, Testing, Adjusting and Balancing of HVAC Systems
Associated Air Balance Council (AABC), National Standards
National Environmental Balancing Bureau (NEBB), National Standards
Civil Engineering Maintenance Inspection Repair Team (CEMIRT), Preacceptance Reports
Sheet Metal And Air Conditioning Contractors National Association (SMACNA), HVAC System TAB Manual

Discussion: Feedback from the Air Force CEMIRT Preacceptance Reports and Design Construction Evaluation (DCE) inspections indicate that problems with HVAC systems continue. CEMIRT personnel have made a series of preacceptance inspections on projects constructed by the Corps over the past ten years. The results are available in reports. Although there are a number of areas addressing design issues, there are also a number of apparently systemic issues in the construction area. Primary among these are the testing, adjusting and balancing (TAB) of HVAC systems. A Process Action Team (PAT) meeting was held 09-11 July 1996 to evaluate recommendations for improving enforcement of TAB of HVAC systems. Several recommendations of the PAT have been incorporated into CEGS 15990. The following is a list of changes to CEGS 15990 that will be in future contracts:

a. TAB firm's current Certification by AABC or NEBB can be confirmed by a phone call to either agency. Phone AABC at (202) 737-0202 or NEBB at (301) 977-3698.

b. TAB Specialist shall be certified by AABC or NEBB. Confirm by phone.

c. A Design Review Report is required 14 days after approval of the TAB Firm and Specialist. Any discrepancies, noted in the report, that would prevent the proper balancing of the HVAC System shall be corrected through a joint effort of engineering and construction.

d. A copy of Preliminary Checklists shall be submitted for each system signed by the TAB Specialist prior to start of TAB. Example of checklists are shown in NEBB and SMACNA HVAC TAB manuals. See figures 1 & 2.

e. Contractor shall submit a TAB Verification Report. The TAB Specialist shall recheck ten percent of the measurements listed in TAB Report. The measurements selected for verification and the individuals that witness the verification test will be selected by the COR.

f. The TAB Specialist and COR shall witness the Duct Leakage Test. The TAB Specialist shall certify that it was successfully completed. Deficiencies noted during leakage test,

that would prevent TAB from producing satisfactory results, shall be corrected thru a combined effort of engineering and construction.

g. TAB shall be performed in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. AABC or NEBB National Standards now become part of each construction contract.

The new requirements will require the TAB Firm to be selected and approved early in the construction phase. The construction schedule should include certain phases of TAB work in the critical path.

Huntsville Training Course HVAC Systems TAB in FY 98 will use, as handouts, both NEBB and AABC Standards Manuals. A NEBB and AABC certified contractor will be part of the instructor staff. Each certified instructor will teach from their respective manual. One full day will be spent at a AABC certified lab for hands on instruction. These are some of the changes being implemented to improve enforcement of TAB of HVAC systems. This Code Forum has been fully coordinated with CEMP-ET. If there are any questions on TAB of HVAC systems my point of contact is CEMP-CE (202) 761-0205.

CHARLES R. SCHROER
Chief, Construction Division
Directorate of Military Programs

Prepared in accordance with AR 25-30 by HQUSACE Directorate of Military Programs, 20 Mass. Ave. N.W. Washington D.C. 20314-1000

FIGURE 1 Systems Ready to Balance
CHECK LIST

	Ready		Date Corrected
	Yes	No	
1. HVAC Units and Built-up Units			
a) *General*			
Louvers installed			
Manual dampers open and locked			
Automatic dampers set properly			
Housing construction-leakage			
Access doors-leakage			
Condensate drain piping and pan			
Free from dirt and debris			
Nameplate data			
b) *Filters*			
Type and size			
Number			
Clean			
Frame-leakage			
c) *Coils (Hydronic)*			
Size and rows			
Fin spacing and condition			
Obstructions and/or debris			
Airflow and direction			
Piping leakage			
Correct piping connections and flow			
Valves open or set			
Airvents or steam traps			
Provisions made for TAB measurements			
d) *Coils (Electric)*			
Size and construction			
Airflow direction			
Duct connections			
Safety switches			
Obstructions			
Free from debris			
Contactors and disconnect switches			
Electrical service and connections			
Nameplate data			
e) *Fans*			
Rotation			
Wheel clearance and balance			
Bearing and motor lubrication			
Drive alignment			
Belt tension			

	Ready		Date Corrected
	Yes	No	
e) *Fans (continued)*			
Drive set screws tight			
Belt guard in place			
Flexible duct connector alignment			
Starters and disconnect switches			
Electrical service and connections			
Nameplate data			
f) *Vibration Isolation*			
Springs and compression			
Base level and free			
2. Duct Systems			
a) *General*			
Manual dampers open and locked			
Access doors closed and tight			
Fire dampers open and accessible			
Terminal units open and set			
Registers and diffusers open and set			
Turning vanes in square elbows			
Provisions made for TAB measurements			
Systems installed as per plans			
Ductwork sealed as required			
b) *Architectural*			
Windows installed and closed			
Doors closed as required			
Ceiling plenums installed and sealed			
Access doors closed and tight			
Air shafts and openings as required			
3. Pumps			
a) *Motors*			
Rotation			
Lubrication			
Alignment			
Set screws tight			
Guards in place			
Tank level and controls			
Starters and disconnect switches			
Electrical service and connections			
Nameplate data			
b) *Piping*			
Correct flow			
Correct connections			

FIGURE 2 Systems Ready to Balance (Continued)
CHECK LIST

	Ready Yes	Ready No	Date Corrected
b) *Piping (continued)*			
Leakage			
Valves open or set			
Strainer clean			
Air vented			
Flexible connectors			
Provisions made for TAB measurements			
Cavitation possibilities			
c) *Bases*			
Vibration isolation			
Grouting			
Leveling			
4. Hydronic Equipment			
a) *Boilers*			
Operating controls and devices			
Safety controls and devices			
Lubrication of fans and pumps			
Draft controls and devices			
Piping connections and flow			
Valves open or set			
Water make-up provisions			
Blowdown provisions			
Electrical connections			
Nameplate data			
b) *Heat Exchangers*			
Correct flow and connections			
Valves open or set			
Airvents or steam traps			
Leakage			
Provisions made for TAB measurements			
Nameplate data			
c) *Cooling Towers/ Evaporative Condensers*			
Correct flow and connections			
Valves open or set			
Leakage			
Provisions made for TAB measurements			
Sump water level			
Spray nozzles			
Fan/pump rotation			
Motor/fan lubrication			
Drives and alignment			
Guards in place			

	Ready Yes	Ready No	Date Corrected
c) *Cooling Towers/ Evaporative Condensers (continued)*			
Starters and disconnect switches			
Electrical connections			
Nameplate data			
5. Refrigeration Equipment			
Crankcase heaters energized			
Operating controls and devices			
Safety controls and devices			
Valves open			
Piping connections and flow			
Flexible connectors			
Oil level and lubrication			
Alignment and drives			
Guards in place			
Vibration isolation			
Starters, contactors and disconnect switches			
Electrical connections			
Nameplate data			
6. Hydronic Piping Systems			
Leak tested			
Fluid levels and make-up			
Relief or safety valves			
Compression tanks and air vents			
Steam traps and connections			
Strainers clean			
Valves open or set			
Provisions made for TAB measurements			
Systems installed as per plans			
7. Control Systems			
Data centers			
Outdoor/return Air/reset			
Economizer			
Static pressure			
Room controls			
8. Other Checks			
a) *Other trades or personnel notified of TAB work requirements*			
b) *Preliminary data complete*			
c) *Test report forms prepared*			